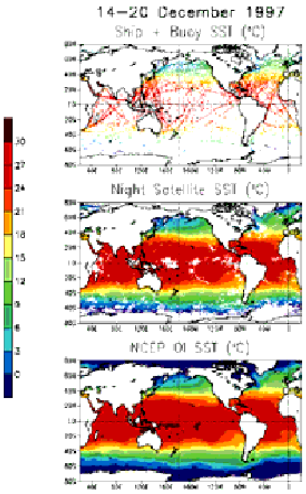
Climate Observations and Services: Ocean Observations

A fully instrumented, 3m discus buoy studying air-sea interactions in the eastern Tropical Pacific.



Sea Surface Temperatures: *In situ* observations (top), night satellite observations (middle), and interpolation analysis from the two sets of observations (bottom).

Tide gauge station

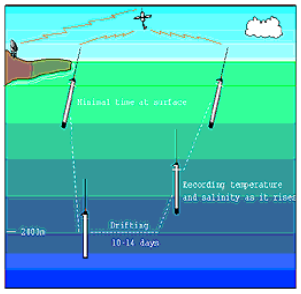
NOAA Request

As part of the $28.0 million FY 2001 request for the Climate Observations and Services Initiative in the Office of Oceanic and Atmospheric Research (OAR) budget activity, NOAA is requesting $9.0 million to continue implementing an integrated global oceanographic observation network necessary for climate forecasting and research. The observation network is based on a set of core observations (e.g., temperature, surface wind stress, salinity, sea level, CO_2), consisting of both onsite (*in situ*) and satellite measurements, that have been identified to satisfy research and operational climate forecasting requirements.

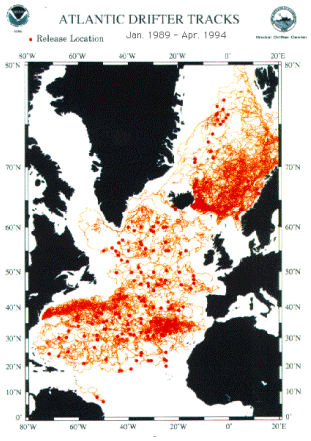
Background

A report prepared on behalf of the National Ocean Research Leadership Council found that a sustained ocean observation program "to detect, track, and predict changes in physical and biological systems and their effects is needed to measure the impacts of humans on the ocean as well as the impact of the ocean on human endeavors." The most critical information required for forecasting seasonal climate variability, such as El Niño, is that from the tropical Pacific. The oceans hold the "memory" of the climate system which leads to our ability to predict climate variability. Just as continuous measurements of weather and climatic condition are maintained on land, similar sustained measurements of the ocean are required to monitor change and to assist in understanding and predicting its impacts. Improvements in climate forecasts depend on improvements in our ocean observations.

The value of the existing NOAA ocean observing networks can be significantly enhanced through activities that ensure continuity of proven systems, improve instrumentation, fill sampling gaps and implement new techniques. High quality surface marine meteorological data are needed to assess, understand and predict climate variability and related impacts on the coastal zone and fisheries on time-scales from seasonal to centennial. While *in situ* observations provide long-term records to calibrate satellite data, monitor trends and increase understanding of climate dynamics, sustained financial support is not guaranteed for either the satellite or sea level stations designed for climate studies. Accurate temperature and salinity data are needed to initialize climate forecast models, interpret satellite data and monitor long-term climate trends. The present sampling methodology, however, cannot meet the present requirements.



Schematic diagram of a single cycle in the mission of a profiling float. The float lifetime is about 100 cycles.



Drifting buoys are placed all over the world using research ships, U.S. Navy aircraft and Volunteer Observation Ships. These are the tracks of drifters in the Atlantic from January 1989 - April 1994.

Improved meteorological (IMET) system mounted on the bow of the R/V Ronald H. Brown.

Proposed Actions

NOAA will: (1) complete its portion of the global array of profiling floats (ARGO) so that for the first time the physical state of the upper ocean (temperature, salinity and water velocities) will be systematically measured and assimilated in near real-time; (2) deploy additional surface drifting buoys in the Southern Hemisphere and other under-sampled regions to complete the Global Drifter Array; (3) improve and increase sampling from Voluntary Observing Ships; (4) upgrade global sea-level stations for satellite altimeter drift calibration and for monitoring long-term trends; (5) develop techniques to optimally combine *in situ* and satellite data sets with ocean model results to produce data products that can be used at all latitudes for marine services, documenting climate variability, and initializing forecast models; (6) develop a methodology for effectively assimilating the satellite altimetry data of sea surface heights into ocean models; and (7) evaluate how the ability to document and forecast climate variability is impacted by the quality and availability of different data sources, including such *in situ* observations as those from tide gauges and moored or drifting buoys and remote observations from satellites.

Benefits

By building on existing NOAA ocean observing networks and data management systems to develop an integrated oceanic network, NOAA will ensure continuity of critical observations, remedy inadequacies in existing systems and obtain needed information. A more comprehensive view of the oceans will greatly enhance our ability to predict their impact on seasonal, interannual, and decadal climate in the U.S. This funding will establish the operational backbone of an integrated ocean observing system serving both scientific and societal needs.

Improved climate monitoring and predictions will enable resource managers in climate sensitive sectors such as agriculture, water management, and energy supply to respond to forecasted climate variability and reduce economic vulnerability. Although many of the consequences of extreme climate cannot be prevented, climate predictions will enable public officials and resource managers to prepare. NOAA will ensure a source of long-term and bias-free data for better monitoring of the global climate system. Also, NOAA will be better able to serve the needs of its customers in industry, the general public, and the Government for more accurate data, information, and knowledge regarding potential changes in climate and extreme weather events as well as about the trends and expectations of future climate and weather events. In short, this initiative provides the caliber of oceanographic data needed to translate climate research gains into operational climate services whose potential benefits extend well into billions of dollars of economic value.

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